CLAIMS

1. A valve, comprising:

a valve body having first and second input ports and first and second output ports;

a valve bore positioned within the valve body;

a spool positioned within the bore;

means for establishing fluid communication between the first and second input ports and the first and second output ports, respectively;

means for establishing fluid communication between the first and second input ports and the second and first output ports, respectively;

means for establishing fluid communication between the second input port and the first and second output ports, simultaneously; and

means for admitting one-way passage of fluid from the second output port to the first input port.

2. The valve of claim 1, further comprising means for preventing fluid from flowing outward from the valve via the second output port.

3. The valve of claim 2, further comprising means for selectively bypassing the preventing means.

4. The valve of claim 1 wherein the spool is configured to return to a centered position within the bore when at rest.

5. The valve of claim 1, further comprising first and second pilot chambers at first and second ends of the bore, respectively, the first and second pilot chambers configured to receive differentially pressurized fluid for moving the spool from a centered position to a rightward or leftward position.

6. The valve of claim 5, further comprising a pilot valve in fluid communication with the first and second pilot chambers and configured to selectively couple the first and second pilot chambers with a high- or low-pressure fluid source.

7. The valve of claim 6, further comprising a solenoid configured to actuate the pilot valve.

8. The valve of claim 5, further comprising first and second pilot valves in fluid communication with the first and second pilot chambers, respectively, each configured to selectively couple the respective pilot chamber with a high- or low-pressure fluid source.

9. The valve of claim 1, further comprising first, second, and third input annuli positioned in a leftward, a central, and a rightward region of the bore, respectively, and wherein the first input port is in fluid communication with the second annulus of the bore and the second input port is in fluid communication with the first and third annuli.

10. A system, comprising:

a hydraulic motor having first and second input ports, configured to apply torque to an output shaft of the motor in a first direction when a fluid pressure at the first input port exceeds a fluid pressure at the second input port, and configured to apply torque to the output shaft in a second direction when the fluid pressure at the second input port exceeds the fluid pressure at the first input port; and

a spool valve having first and second output ports coupled to the first and second input ports, respectively, and a high-pressure input port and a low-pressure input port, the valve configured to selectively couple the high-pressure and low-pressure input ports to the first and second input ports, respectively, or to the second and first input ports, respectively, according to a selected position of a spool of the valve.

11. The system of claim 10, further comprising a check valve positioned and configured to permit fluid flow into the hydraulic motor from the first input port, and to prevent fluid flow into the hydraulic motor from the second input port.

12. The system of claim 11, further comprising means for overriding the check valve.

13. The system of claim 10, further comprising a check valve configured to permit fluid passage from the second input port to the high-pressure input port.

14. The system of claim 10 wherein the motor is configured to operate as a pump when the motor is caused to rotate in opposition to torque at the output shaft.

15. The system of claim 10, further comprising a high-pressure fluid source coupled to the high-pressure input port.

16. The system of claim 15 wherein the high-pressure fluid source is a high-pressure accumulator.

17. The system of claim 15, further comprising a hydraulic pump having a high-pressure output coupled to the high-pressure fluid source.

18. The system of claim 17, further comprising an additional motor coupled to the hydraulic pump.

19. The system of claim 18 wherein the additional motor is powered by internal combustion.

20. The system of claim 10 further comprising a vehicle having a plurality of wheels coupled to a drive train, and wherein the output shaft of the hydraulic motor is coupled to the drive train of the vehicle.

21. A valve for controlling a hydraulic device, comprising:

a valve body having an interior bore;

a first valve port configured to be coupled to a fluid source pressurized to a first pressure range;

a second valve port configured to be coupled to a fluid source pressurized to a second pressure range, lower than the first pressure range;

an output port configured to carry fluid to a hydraulic device;

an input port configured to receive fluid from the hydraulic device;

a valve spool axially movable within the bore and configured to selectively channel fluid from the first and second valve ports to the output and input ports, respectively, while in a first position, from the second valve port to both the output and input ports while in a second position, and from the second and first valve ports to the output and input ports respectively, while in a third position; and

a check valve configured to permit one-way fluid passage from the input port to the first valve port.

22. The valve of claim 21, further comprising an anti-reverse check valve configured to prevent fluid from flowing into the valve via the output port.

23. The valve of claim 22 wherein the anti-reverse check valve comprises a bypass mechanism configured to override the anti-reverse check valve such that, when the mechanism is activated, fluid may flow into the valve via the output port.

24. The valve of claim 21, further comprising first and second hydraulic pilot chambers defined by first and second extreme ends of the bore, respectively, and by first and second ends of the spool, respectively, the first and second pilot chambers configured to receive pressurized fluid to act on the first and second ends of the spool, respectively.

25. The valve of claim 24 wherein the spool is configured to move to the first position in the event that a fluid pressure in the first pilot chamber exceeds a fluid pressure in the second pilot chamber, to move to the third position in the event that the fluid pressure in the second pilot chamber exceeds the fluid pressure in the first pilot chamber, and to move to the second position in the event that the fluid pressure in the first pilot chamber is substantially equal to the fluid pressure in the second pilot chamber.

26. The valve of claim 24 wherein a surface area of an end face of each of the first and second ends of the spool is substantially less than a transverse sectional area of the bore.

27. A method of operating a hydraulic pump/motor, comprising:

placing a spool of a spool valve in a first position, such that a first fluid port of the pump/motor is in fluid communication with a first pressurized fluid source and a second fluid port of the pump/motor is in fluid communication with a second pressurized fluid source, and such that a torque in a first direction is applied to an output shaft of the pump/motor;

placing the spool in a second position, such that the first and second fluid ports of the pump/motor are in fluid communication with each other and with the second pressurized fluid source, and such that substantially no torque is applied to the output shaft; and

placing the spool in a third position, such that the first fluid port of the pump/motor is in fluid communication with the second pressurized fluid source and the second fluid port of the pump/motor is in fluid communication with the first pressurized fluid source, and such that a torque in a second direction is applied to the output shaft of the pump/motor.

28. The method of claim 27, further comprising preventing, while the spool is in the third position, the output shaft of the pump/motor from rotating in the second direction.

29. The method of claim 27, further comprising permitting a one-way flow of fluid from the second fluid port of the pump/motor to the first pressurized fluid source, without regard to the position of the spool.

30. The method of claim 27, further comprising moving the spool to the second position if a malfunction of the pump/motor or spool valve is detected.